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Predictions based on the cumulative curves: Basic principles and nontrivial example

R.R. Nigmatullin [a,*], I.I. Popov [a], D. Baleanu [b]

[a] Theoretical Physics Department, Kazan State University, Kremlevskaya str.18, 420008, Kazan, Russia
[b] Department of Mathematics and Computer Science, Faculty of Arts and Sciences, Çankaya University-06530, Ankara, Turkey

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ABSTRACT

In this paper the new prediction method based on analysis of the integrated (cumulative) curves is suggested. This method includes the procedure of the optimal linear smoothing (POLS) for the finding of optimal trends, independent "reading" of relative fluctuations in terms of β-distribution function that are formed after subtraction of the calculated trend and the recognition of the proper fitting hypothesis for the integrated optimal trends by the eigen-coordinates method. The combined noninvasive approach was applied to analysis of temperature data obtained from the site http://data.giss.nasa.gov/gistemp/ related to the global warming (GW) phenomenon. These data are considered as nontrivial examples of verification of new forecasting method. The available data were combined into six files covering the mean/anomalous temperature 1546 month's points covering the period from the January of 1880 up to October of 2008. Besides the global registered points the combined files included in themselves the north/south data points measured independently for both the Earth's hemispheres. The combined new method (preliminary verified on mimic data) applied to these files predicts the changing of the GW period by the global cooling (GC) period that will happen during the years 2038–2136. Besides this important result a new method helps to discover the influence of a small but stable oscillating process with a set of self-similar periods $\Omega_n = \Omega_0 \xi^n$, n = 0, ±1, ±2, ±3, ±4 with mean period $\langle T \rangle$ = 12.55 year. This fact should present interest for ecologists and meteorologists working in this field.

1. Introduction

Prediction of behavior of random sequences is a very important problem for the whole natural sciences. In the recent past we had special monographs related to analysis of specific behavior of time series. We remind here some fundamental books related to this subject written by well-known statisticians [1–6]. It is necessary to stress here also an important book [7], where general methods of forecasting of different time series are outlined. As one can see below a new approach that is presented in this paper adds new important features for forecasting of self-similar sequences. Many researchers from different fields of sciences are trying to solve this problem and make the forecasting procedure more accurate for the given limit of the temporal interval. But recent investigations show that any "forecast of a future event" has some limits of its predictability and there is a class of random processes related to non-linear and fractal dynamics that are *unpredictable* in principle. Papers related to this interesting subject can be found from many sources but here we discuss of only papers [8–12], written by two well-known specialists actively working in this field.

* Corresponding author. Tel.: +7 8432360612.
E-mail addresses: nigmat@knet.ru (R.R. Nigmatullin), Popov-Ivan87@yandex.ru (I.I. Popov), dumitru@cankaya.edu.tr (D. Baleanu).

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